

REMARKS

Applicant first wishes to thank the Examiner for the allowance of Claims 9-11 and for indicating that Claims 2-6, 14 and 15 contain allowable subject matter. As noted above, the rejected claims 1, 7, 8, 12 and 13 are being resubmitted, as Applicant believes these claims patentably distinguish from the cited and applied prior art.

The invention, in brief, concerns a method and apparatus for operating a heat exchanger that avoids certain problems associated with fluid to be cooled (the “cooled” fluid) freezing onto the heat transfer surface. Such problems particularly occur where a cryogenic fluid such as liquid nitrogen is used as the cooling fluid so there is a real likelihood of the cooled fluid freezing onto the heat exchange surface.

Should the cooled fluid begin to freeze on the cooling surface, the insulating effect of the resulting ice layer alters properties of the heat exchanger that may not be detected simply by monitoring the temperature of the cooled fluid.

In accordance with the present invention, the problems are addressed by monitoring the temperature of the heat transfer surface in contact with the cooled fluid rather than the temperature of the cooled fluid itself. The flow of either the cooled fluid or the cooling fluid is then adjusted in response to this temperature.

In a preferred embodiment, flow adjustments are made when the temperature of the surface in contact with the cooled fluid falls to a temperature that is at least 50° F colder than the freezing temperature of the cold fluid.

Claims 1, 7, 8, 12 and 13 stand rejected under 35 U.S.C. 102(b) as being anticipated by Mille (US 3, 696, 636). For a rejection under 35 U.S.C. 102(b) to stand each element of the claims(s) must be found in a single reference. This does not appear to be the case here.

In Mille, the cooled fluid flows through several coils of a heat exchanger that all feed into a collector (35) with the cooled fluid from the collector leaving the heat exchanger through a pipeline (31). A cooling fluid such as a cryogenic fluid enters the heat exchanger and flows around the outside of the coils and the collector, and then leaves

the heat exchanger through openings at the top of the heat exchanger. According to the Mille specification at column 5, lines 6-9,

“A temperature sensitive device 36, e.g., a thermocouple, is placed on collector 35, which corresponds to the zone where the temperature of the *fluid to be cooled is the lowest*” (emphasis added).

With respect to Claim 1, there is nothing in this passage of the reference suggesting that the thermocouple 36 on the collector directly measures the temperature of the collector surface rather than the temperature of the cooled fluid that passes in contact with the thermocouple. The passage merely says that the thermocouple is “placed on” the collector at a location where the temperature of the cooled fluid is the lowest. Saying the location is where the temperature of the cooled fluid is the lowest does not equate to a statement that the sensor is monitoring the temperature of the cooling surface at this location. Accordingly it cannot be said that the reference discloses the claimed feature as set out in Claim 1 of “directly monitoring the temperature” of the surface in contact with the cooled fluid.

Moreover, the emphasized portion of the quoted passage (saying that the location of the thermocouple is where the temperature of the cooled fluid is lowest) appears to indicate that it is the cooled fluid temperature that is being monitored and not the surface of the collector. This interpretation appears corroborated by other portions of the Mille specification. For example, column 6, lines 1-4 refer to a comparison of the output voltage of the thermocouple with “a reference voltage proportional to the outlet temperature desired” (the “outlet temperature” being the desired temperature of the cooled fluid and not the temperature of any surface).

As a final point it is noted that the specification at column 6, lines 23-25 indicate that the temperature regulating device “is set at a temperature very slightly higher than the freezing temperature” of the cooled fluid. Applicant submits that this further confirms that the temperature being monitored is the temperature of the cooled fluid and not the temperature of the heat exchange surface in contact with the cooled fluid.

Dependent Claim 7 includes all the limitations of Claim 1 and therefore the arguments as set out above with respect to Claim 1 apply equally to Claim 7. In addition,

Claim 7 further is distinguished in that the reference discloses making a correction in response to a given temperature condition. That is, when a certain temperature is reached, corrective action is taken. In contrast, Claim 7 recites making a correction "in response to the temperature of the first surface decreasing at a rate exceeding a predetermined value" (emphasis added). The reference does not disclose making a correction in response to the rate of change and therefore does not anticipate the invention as set out in Claim 7.

Independent apparatus Claim 12 follows method Claim 1. Accordingly Applicant submits that Mille does not disclose a

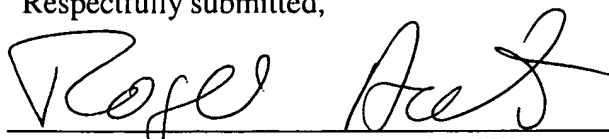
"monitoring means for directly monitoring the temperature of the first surface of the heat transfer wall" or an

"adjusting means acting responsive to the temperature of the first surface for adjusting the flow of one of the cooled fluid and cooling fluid through the heat exchanger so as to prevent the freezing of the cooled fluid onto the first surface".

Having a temperature sensitive device "placed on collector 35" as disclosed by Mille does not of itself disclose or suggest a monitoring means for directly monitoring the temperature of the surface or an adjusting means arranged to act responsive to the surface temperature to adjust flow conditions.

In view of the comments as set out above, Applicant considers that all the claims are in condition for allowance, which action is respectfully requested..

Respectfully submitted,



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